DOCUMENT RESUME

ED 092 006 HE 005 565

AUTHOR	Koehler, John E.; Williams, Albert P., Jr.
TITLE	Econo ic Implications of Changes in Financing Medical Educa ion. The Rand Paper Series P-5150.
INSTITUTION	Rand Corp., Santa Monica, Calif.
SPONS AGENCY	Department of Health, Education, and Welfare, Washington, D.C. Office of the Assistant Secretary for Planning and Evaluation.; Health Resources Administration (DHEW/PHS), Bethesda, Md.
PUB DATE	Dec 73
NOTE	21p.
EDRS PRICE	MF-$0.75 HC-$1.50 PLUS POSTAGE
DESCRIPTORS	*Educational Economics; *Educational Finance; Federal Aid; Federal Legislation; Federal Programs; *Higher Education; *Medical Education; *Medical Schools

ABSTRACT

To increase the supply of doctors, the government has become directly involved in physician education. Of the $673 million appropriated for health manpower programs in 1972, 55% was for medical schools. Legislation to date has emphasized expansion of medical education output in the aggregate, but increasing attention has been directed to the composition of the output with regard to the type and location of practice and to the equality of educational opportunity for ethnic minorities and women. This paper examines changes that have occurred in the medical education system concurrently with the growth of Federal programs designed to influence that system's output. The data indicate that the system has responded very favorably. Capacity is expanding rapidly, discrimination against women has apparently disappeared, medical schools are seeking out and admitting qualified individuals from minority groups, and financial barriers to medical education have been lowered. (MJM)

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December 1973

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P-5150

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ECONOMIC IMPLICATIONS OF CHANGES IN FINANCING MEDICAL EDUCATION[1]

by John E. Koehler and Albert P. Williams, Jr.
The Rand Corporation

Direct federal involvement in physician education began only a decade ago with the passage of the Health Professions Education Act of 1963. This act was limited to construction grants for schools and their affiliated hospitals and education loans for students. In 1965, the first award to schools of medicine under this act amounted to only $60 million. Since then, the scope of federal involvement in physician education has expanded greatly. The appropriation for health manpower programs in fiscal year 1972 was a total of $673 million, about 55 percent of which was for medical schools.

The initial federal policy concern was simple: to increase the supply of physicians and alleviate a national shortage of doctors. A doctor shortage had been perceived since at least the 1930s, and calculations were based on highly aggregated data and usually expressed in terms of physicians per 100,000 population.[2] However, as the federal government became more involved in the task of alleviating the shortage, the objectives of federal programs became more complex. To be sure, all legislation to date has emphasized expansion of medical education output in the aggregate, but increasing attention has been directed to the composition of the output with regard to the type and location of practice and to the equality of educational opportunity for ethnic minorities and women. Medical schools have been encouraged to shorten and otherwise revise their basic curricula as well as to do research on alternative health care delivery.

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[1]The work upon which this paper is based was performed pursuant to contract NIH-72-4196, with the Health Resources Administration and the Office of the Assistant Secretary for Planning and Evaluation, Department of Health, Education and Welfare. This paper was presented at the joint meeting of the American Economic Association and the Health Economics Research Organization on December 30, 1973 in New York City.

[2]A summary of different approaches to estimating physician shortages during the period before 1960 is contained in Rashi Fein, The Doctor Shortage: An Economic Analysis, The Brookings Institution, Washington, 1967, pp. 6 ff.

The purpose of this paper is to examine some of the changes that have occurred in the medical education system concurrently with the growth of federal programs designed to influence that system's output. We are concerned primarily with explicit and implicit federal program objectives, but we do not attempt here to distinguish the importance of federal programs from other forces with parallel objectives.[1] Nor do we make judgments about what federal policy should be or what constitutes a satisfactory response on the part of the medical education system.

ENROLLMENT EXPANSION

Federal policy appears to have achieved its greatest success in the simple objective of expanding medical school enrollment (see Table 1). Between academic years 1950-1951 and 1965-1966, first year enrollment of medical schools grew at the rate of only 1.3 percent per year. In contrast, first year places since 1965-1966 (the first year of federal formula grants for enrollment expansion) have grown at the yearly average rate of 6.6 percent per year. The yearly growth rate reached a maximum in 1972-1973, the first year that all schools were required to increase enrollment as a condition of obtaining capitation grants.

It is hardly surprising that the medical schools responded to the strong incentives for expansion provided by the Comprehensive Health Manpower Training Act of 1971. The Act provided payments of up to $2500 per student in each of the first three years of medical school and up to $4000 per graduate (actual payments were about 70 percent of authorized levels) for each school that increased the size of its entering class between 1970-1971 and 1972-1973 by ten students or 5 percent, whichever was greater.[2] The Act permitted the Secretary of

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[1]This paper is based on a larger study in progress, "The Effects of Federal Programs on Academic Health Centers," sponsored by the Health Resources Administration and the Offices of the Assistant Secretary for Planning and Evaluation, Department of HEW. A major objective of that larger study is to try to sort out federal program effects from the effects of other forces on the centers.

[2]To encourage shortening of medical school curricula, the act provided up to $6000 per graduate of a three year M.D. training program or a program that was structured to award the M.D. degree with six years of post-high school education.

Table 1

GROWTH IN U.S. MEDICAL SCHOOL ENROLLMENT
1931-1978

Academic Year	Number of Schools	First Year Enrollment	Graduates
1930-1931	76	6,456	4,735
1940-1941	77	5,837	5,275
1950-1951	79	7,177	6,135
1955-1956	82	7,686	6,845
1960-1961	86	8,298	6,994
1965-1966	88	8,759	7,574
1967-1968	94	9,479	7,973
1969-1970	101	10,401	8,367
1970-1971	103	11,348	8,974
1971-1972	108	12,361	9,551
1972-1973	112	13,726	10,391
1973-1974	114	13,790	10,930[b]
1975-1976	114	14,820[a]	13,220[b]
1977-1978	114	15,541[a]	13,810[b]

SOURCE: "Medical Education in the United States 1972-1973," Journal of the American Medical Association, Vol. 226, No. 8, November 19, 1973.

[a]Projection in source.

[b]Projections of authors using aggregate data on withdrawals and transfers for most recent four years.

Health, Education and Welfare to waive the mandatory enrollment increase when it could not be accomplished "because of limitations of physical facilities available to the school for training or...without lowering the quality of training provided therein."[1] However, these provisions of the act were interpreted very narrowly, and no waivers for enrollment expansion were granted for the first year of capitation support. The underlying assumption of the HEW administrators--and perhaps Congress--seemed to be that there was room for 10 to 15 more in every medical school first year class. Bonus payments were made to schools that exceeded the mandated enrollment increase.

Although it is not unreasonable to judge a policy successful when the federal government gets the results it seeks, it would be wrong to conclude that the government alone was responsible for getting the nation's medical schools to expand their enrollment. In 1968, both the American Medical Association and The Association of American Medical Colleges jointly issued statements calling for "substantial increase in the enrollments of existing U.S. medical schools."[2] Concerned with an insufficient supply of physicians, a number of state legislatures called for expansion in their state school enrollments and for the construction of new medical schools within their state university systems.

It is difficult to assess the importance of federal programs relative to other forces in much of the enrollment expansion that occurred in medical schools in 1968 and subsequent years, but it is reasonable to establish a lower limit on the enrollment expansion that can be attributed to federal forces. Between 1967-1968 and 1970-1971, 23 of the 89 fully accredited schools expanded their first year class size by 5 percent or less.[3] They had an aggregate enrollment growth rate of less than 1 percent per year over the three year period--that is, less than the meager growth rate of the whole medical education system during the decade and a half before 1965. Only eight of these 23 schools participated in federal programs for enrollment expansion before the advent of capitation grants, and their participation did not occur until after it

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[1] Public Health Service Act, Title VII, Part E, Section 770.

[2] The Journal of the American Medical Association (JAMA), Vol. 206, No. 9, November 25, 1968, p. 1990.

[3] JAMA, Education Numbers, 1968, 1971, 1973.

seemed pretty clear from the policy debate that substantial federal institutional support would be made contingent on enrollment expansion.[1] All 23 schools participated in the capitation program and increased their first year class sizes by an average of 14 percent between 1970-1971 (the base year for the capitation grants) and 1972-1973 (the first academic year for which capitation payments were made). The earlier resistance of these schools to expansion establishes a prima facie case that the strong federal program thrust was finally responsible for their decisions to increase class size in 1971 and 1972.

The capitation grant program was most surely responsible for expansion of a different sort in 1972-1973. The great majority of the schools--all but the 23 discussed above--had expanded enrollment to a greater or lesser extent before capitation grants, many at the instigation of the federal government. Several of these felt that they had already reached their "full capacity," and they planned to stabilize their class size at levels reached before 1972-1973. As a group, they viewed as unfair the capitation formula that took no account either of past growth or of factors related to capacity. Ultimately, all these schools participated in the 1972-1973 capitation program and accepted the mandated enrollment increase. However, there is little doubt that some in this group would not have undertaken a final expansion in the absence of the strong "all or nothing" financial incentives of the capitation program.

Although federal legislation has made no distinctions between private and public (state) medical schools, differences in the two groups suggest some attention to the differential effects of federally sponsored enrollment expansion programs. For the 89 fully accredited medical schools and basic medical science schools (two-year schools) in operation during 1967-1968, federal programs do not appear to affect public and private schools differently. Over the five-year period between 1967-1968 and 1972-1973, total enrollment in the public schools increased by 36 percent and in the private schools 35 percent. Both

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[1] Unpublished data from the National Institutes of Health, Bureau of Health Manpower Education.

public and private schools were represented in the 23 schools that initially resisted enrollment expansion in proportion to their numbers in the whole population of schools.

Although existing public and private schools responded equally to enrollment expansion incentives, the situation was quite different with regard to federal programs designed to stimulate the development of new medical schools. Fifteen new medical schools have been accredited since 1967-1968. Eight more new schools admitted students and were in various stages of development in 1972-1973.[1] Only five of these 23 schools were private. All of the private schools had either been planned before 1963, when federal programs offered specific incentives for new school development, or were built around large medical centers with well-established graduate medical education programs.

Federal funds, together with state funds, caused a proliferation of new public schools, but federal assistance for new schools appears not to have been sufficient to start any private medical school purely from scratch. The one-sided nature of this growth has some important implications for the individual's access to medical education.

STUDENT ADMISSION AND EQUALITY OF ACCESS

Both state and federal governments have multiple objectives in their relations with the schools, and they apply pressures and provide incentives in numerous ways. Both are concerned with the dual nature of a medical school as supplier of capital goods to the health industry and as gateway to a career providing high income, prestige, and social status.

In such a complex pattern of relations, inconsistency between federal and state goals is nearly inevitable. Curiously, federal policy appears not to consider any inconsistency; and even if it did, the federal government might overlook the inconsistency in the interest of the New Federalism. Federal policy has aimed at increasing the number of physicians, at eliminating barriers to entry based on sex and race, and at reducing the financial barriers to medical education. States, as we

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[1] JAMA, Vol. 226, No. 8, November 19, 1973.

have seen, have responded to federal incentives by increasing the number of places in state-supported schools. The expansion of state schools, however, has increased the range of discrimination by residence. In exchange for what may be a small net flow of resources from state government to the school, legislatures have insisted on strong discrimination against non-resident applicants.

The pressures from state and federal governments combine with the desires of the medical school faculty for a particular type of entering class and the characteristics of the applicant pool to determine admissions outcomes. To assess the relative importance of the various considerations, we have gathered data from ten schools and estimated logit equations describing the probability of acceptance to medical school as a function of academic background, performance on the Medical College Admissions Test (MCAT), quality of undergraduate school attended, residence, sex, race, and other personal attributes. To assess the possible effect of federal policy on student selection, we need to compare current admissions policies with those of an earlier period. Table 2 presents such a comparison.

The data on which the equations are based are drawn from one of the public schools in our sample of ten. Data for the entering class of 1972 were provided by the American Medical College Admissions Service (AMCAS), a central clearing-house for information on applicants and admissions decisions. AMCAS was created in 1970, and data for earlier periods are hard to find. This school, along with several others in our sample, maintained its own admissions records before the establishment of AMCAS, and the 1969 data are drawn from this admissions information system.

Specification of the models and choice of subpopulations rests on both previous literature and observation of the admissions process. There are numerous studies of both admissions outcomes and committee views of important considerations in student selection. These generally agree on the importance of science achievement as measured by undergraduate science grades and the science MCAT. In addition, some consideration is usually given to the quality of the undergraduate school attended by the applicant and other measures of general intelligence,

Table 2

LOGIT EQUATION COEFFICIENTS FOR MEDICAL SCHOOL ADMISSION

Variable	1969 Total	1972 Non-Minorities	1972 Minorities
Science GPA	2.66***	3.47***	1.14**
Non-science GPA	2.02***	.409	.378
Science hours	.00112	.00706	.0282**
Grade trend	.369	-.0935	-.644
Verbal MCAT	.00554**	.00534**	.00121
Quantitative MCAT	.00612**	.00374	.00191
General information MCAT	.00403	.00153	-.00087
Science MCAT	-.00635**	-.000413	.00688*
Selectivity index for undergraduate college	.506***	.220**	.171
Years older than 22	-.0432	-.408**	-.319**
Marital status	.262	.726	.184
Junior applicant	-.828*	-.235	-.084
Attended graduate school	.642	.564	-.952
Female	-1.44**	-.363	-.174
Resident	1.55***	.939**	-.171
Same undergraduate school	.954**	.452	-.171
Constant	-25.8	-23.8	-11.6
Chi-square	(231.5)	(153.4)	(62.9)
D.F.	(16)	(16)	(16)
Significance (p <)	(0.000)	(0.000)	(0.000)
N	466	818	172

*Denotes significance at .1.

**Denotes significance at .05.

***Denotes significance at .01.

Table 2 (continued)

Variable Definitions and Notes

Science GPA	Cumulative average grades in science and mathematics courses, standardized to A = 4.0
Non-science GPA	Standardized cumulative average in all non-science academic courses.
Grade trend	Cumulative GPA minus freshman year GPA.
Verbal, quantitative, general information, and science MCAT	Scores on the four parts of the Medical College Admission Test. The MCAT is standardized approximately to a mean of 500 and standard deviation of 100.
Selectivity Index	A scale from 1 to 9 of the selectivity in admissions of the undergraduate college attended by the applicant. Taken from Barron's Profile of American Colleges.
Marital status through same undergraduate school	A set of dummy variables taking values of 1 if the applicant is a junior rather than a senior, has attended graduate school, is female, is a resident of the state in which the medical school is located, and attended the undergraduate college on the same campus as the medical school.

The estimation procedure is a maximum likelihood logit technique developed by Marc Nerlove, a Rand consultant at Northwestern University, and Kenneth Maurer of Rand. The probability of acceptance estimated from the equation can be calculated as:

$$\Pr(\text{acceptance}) = \frac{1}{1 + e^{-(\alpha + \beta x)}}$$

where α and β are the estimated coefficients and x is a vector of independent variables.

such as non-science grades and the verbal and quantitative MCATs.[1] In most schools an interview is required for admission in addition to letters of recommendation. Admissions committees usually stress the importance of these data but agree uncomfortably that interviews are non-reproducible across interviewers and letters from other than well-known colleagues are hard to interpret. Discrimination against candidates who are more than a few years older than 22 is based on the fear that those applicants are more likely to drop out of medical school and on the expectation that they will have shorter productive careers than younger candidates. All of these considerations are documented in the literature and in our interviews with committee members and admissions deans. In addition, we have spent some time observing admissions committee meetings in sample schools. Choice of subpopulations has varied from school to school and is based on the structure of committee responsibilities. For example, the equation presented here is drawn from a school in which decisions on minority-group candidates are delegated to a special subcommittee that includes several minority-group faculty. The mandate of the subcommittee quite explicitly allows it to weigh measures of academic performance differently than does the general committee. That the subcommittee does in fact weigh such measures differently is reflected in the coefficients of the logit equations.

In this school we find, as we would expect, that in the 1969 total and 1972 non-minority samples, scientific academic achievement as measured by science GPA and attendance at a highly selective undergraduate school is an important consideration in admission. The test scores present a mixed picture: The verbal and quantitative MCATs are basically measures of general intelligence. The general information MCAT is a test of knowledge of current events, the arts, and society and is honored as indicating well-roundedness but is apparently ignored. The science MCAT correlates fairly highly with both the science GPA and

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[1] Cf. Ronald L. Hamberg et al., "Perceptions and Usage of Predictive Data for Medical School Admissions," Journal of Medical Education, Vol. 46, November 1971, pp. 959-963; and the classic volume Helen H. Gee and John Cowles, eds., Appraisal of Applicants to Medical School, Association of American Medical Colleges, Evanston, Illinois, 1957.

the selectivity index; this correlation may account for the ambiguity of its effect here. The applicant's age has the expected negative effect on admission in the 1972 sample.

Patterns of discrimination and non-discrimination that are of policy interest are revealed in the three equations. For non-minorities, residence is an important consideration. Since the school shown here is a state institution, that result is not surprising.[1] Many "private" schools, however, also have arrangements for financial support from their state in exchange for giving special consideration to applicants from the state. For at least one such private school, fitting an admissions equation similar to these reveals an even more powerful state residence effect than we find in this public school. A significant change in policies in admissions of women can be seen by comparing the 1969 and 1972 equations. The strong discrimination women faced in 1969 has been eliminated. This finding is consistent with what we have found at several other schools: In equations fitted to the 1972 admissions data, the dummy variable for sex is either insignificantly different from zero or is positive. Table 3 shows the increase in enrollment of women over this period in all medical schools.

Enrollment of students from minority groups has risen rapidly as well. The differences between the minority and non-minority equations of Table 2 allow a comparison of the ways in which the two groups of applicants are evaluated. The insignificance of the verbal MCAT and the selectivity index probably reflects admissions committees' adaptation to the belief that general intelligence tests discriminate against minorities and the fact that minority applicants come, on average, from less demanding undergraduate schools. The insignificance of residence reflects the keen competition nationally for qualified minority students. In all the schools we have studied, some special and often fairly substantial effort has been directed toward locating such people and persuading them to enroll.

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[1] Of the 7521 first-year places in publicly owned medical schools in 1973-74, 6,676 (or 89 percent) were filled by state residents. By contrast, 2,997 (or 50 percent) of the 5939 places in private schools were taken by residents. JAMA, Vol. 226, No. 8, November 1973, p. 911.

Table 3

ENROLLMENT OF WOMEN AND MINORITIES[a]
IN FIRST YEAR MEDICAL CLASSES

School Year	Women	% of Class	Minorities[b]	% of Class
1969-70	952	9.2	387	4.0
1972-73	2315	16.9	1086	6.7

SOURCE: JAMA, Vol. 226, No. 8, November 19, 1973, pp. 910 and 913.

[a]Minorities include Afro-American, Mexican American, American Indian, Puerto Rican (Mainland).

[b]Excludes Howard and Meharry.

The logit equations shown in Table 2 provide a simple technique for evaluating the special consideration given minority candidates. If we have the values for MCATs, grades, and the other independent variables, we can substitute those values into the logit equation and estimate the probability that an applicant with those MCATs, grades, etc. would be admitted. We can, for example, consider a strong minority candidate, one whose scores all lie one-half standard deviation above the mean for minority applicants. Assume, also, that this hypothetical applicant is 22 years old, and is a non-resident, unmarried, and so forth so that all of the dummy variables take the value zero. The probability that such a candidate would be admitted if the minority equation is used to make the prediction is .53; by contrast, the probability that a candidate with the same characteristics would be admitted if the non-minority equation is used to make the prediction is .0047. Since the equations can be viewed as surrogates for the admissions process, the differences between these two probabilities indicate the importance of minority status. Table 4 shows these calculations together with the estimated probabilities for a candidate whose scores are one-half standard deviation above the non-minority mean and for whom all the dummies are equal to zero. Although these data refer to only one school and to one year, they do support the hypothesis that

Table 4

PROBABILITY OF ACCEPTANCE BY EQUATION BY CANDIDATE

Hypothetical Candidate	Equation	
	Minority	Non-Minority
Minority Mean + 1/2 s.d.	.53	.0047
Non-Minority Mean + 1/2 s.d.	.86	.057

the medical schools are making a substantial effort to adapt to the different characteristics of the minority applicant pool.

The patterns we observe in discrimination by sex, race, and residence are only partly related to the system of financing medical education. In the case of residence the relation is clearest. Discrimination against non-residents may be explicitly announced and related in school policy statements to receipt of state support. Many state schools admit only a token 2 or 3 percent of each entering class from out of state. The effectiveness of pressure to discriminate is derived from the financial support provided by the state, and there is no apparent countervailing federal pressure.

Declining discrimination against women seems only tenuously related to any policy instruments. Perhaps it is best seen simply as a reflection of more general social trends.

For minority applicants the sources of the change we observe are complex and difficult to weigh. The federal government has for several years maintained a program to encourage increased enrollment of minorities. Many schools received Special Project Grants to establish programs to recruit and tutor minority students. Simultaneously, the AMA and AAMC issued influential policy statements favoring Affirmative Action. Doubtless these influences had some effect. At each of the schools we have studied, however, coherent stories are told of the development of minority programs almost without reference to events on the national

level. At some institutions the changes came about dramatically in the wake of the upheavals and confrontations of 1968 and 1969. At others, the process is said to have been one of adopting an idea whose time had come. It seems safe to say that the uniformity and simultaneity of the changes that occurred are due in part to federal policy and programs aimed at increasing minority enrollments, but some portion of the impetus for change came from within the schools themselves.

Barriers based on inability to pay for a medical education seem to have disappeared. In the schools we have studied, the admissions committee action must be unrelated to an applicant's ability to pay because information on an applicant's financial status is not gathered until after the admission decision is made. At one school this strong conclusion must be amended slightly: Applicants were asked to indicate whether they intended to apply for financial aid. When a dummy variable for this response was included in the admission equations, however, it was unrelated to the outcome. Schools have been unable to make advance commitments, in any case, because the level of funding for the Health Professions Loans provided by the federal government has remained undecided until mid-summer or beyond because of delays in Congressional appropriations; schools have not known how much money they would have until the class had nearly matriculated or even later. Considerations of income forgone and unwillingness to forgo income for additional education may still prevent potentially qualified applicants from applying to or preparing for medical school, but once candidates reach the stage of application, ability to pay appears to become irrelevant. That this is so is due in part to the growth of federal loan programs and to the extension of loan guarantees, but the role of the private capital market appears to be growing as well.

There is some interaction between minority opportunities and financial aids. Although evaluation of a medical student's total need for financial aid is determined in most cases by a standard formula and procedure, the proportion that is loan rather than scholarship is varied by the schools in order to compete for qualified minority applicants. Thus, although the total size of the financial aid package received may be the same for all students with similar resources, the combination will be somewhat more favorable for minority students.

FINANCING EDUCATION IN THE ACADEMIC HEALTH CENTER

Analyses of the financial aspects of medical education invariably run afoul of the problem of joint production, and for good reason. Academic health centers are involved in joint production in the broad categories of education, research, and care; and the education process is itself a joint production activity involving Ph.D. basic science students, interns, residents, and frequently other health professionals, as well as medical students. The problem arises when the consumers of these different products--or those who are willing to subsidize the consumption of others--insist on the simple, seemingly very reasonable principle that they pay only their share of costs.

Since only a relatively small portion of total costs are pure costs associated with a single product, there is no conceptually unambiguous way to allocate a substantial portion of the costs--that is, the joint costs--of the products of the academic health centers.[1] A number of "reasonable" cost allocation approaches have been suggested, the most recent by the Association of American Medical Colleges (AAMC).[2] The U.S. Congress even mandated a study by the Institute of Medicine to find the "average annual per-student education costs" for schools of medicine and other health professions.[3] Any unequivocal single answer to the question of educational costs must necessarily have its origins in judgment, bargaining, or politics, not in a deterministic cost analysis. Moreover, unlike the analogous problem encountered by the oil refiner, those who cost (or more appropriately price) the joint products of academic health centers have little in the way of direct market signals to guide their decisions.

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[1] For the discussion of the joint production/joint cost problem, see John E. Koehler and Robert L. Slighton, "Activity Analysis and Cost Analysis in Medical Schools," Journal of Medical Education, Vol. 48, June 1973.

[2] Association of American Medical Colleges, Undergraduate Medical Education, Elements - Objectives - Costs, Report of the Committee on the Financing of Medical Education, October 1973.

[3] Public Law 92-157, Section 205. An interim report, Costs of Education of the Health Professions, National Academy of Sciences, Washington, D.C., 1973, was submitted to Congress in March 1973.

This paper does not suggest a basis for costing or pricing the medical education component of the output of academic health centers. Our modest objective is to articulate some of the economic considerations relevant to burden sharing of these joint production costs, particularly the education component. A logical first step is to make some distinctions regarding the public and private natures of the different joint products of academic health centers.

Any entrepreneur offered an investment with a lifetime rate of return in the 15-20 percent range would probably evince some interest. A number of discounted present value calculations of earnings streams show rates of return at least in that range for a physician's educational investment.[1] Thus, human capital theory suggests that the individual physician's education should be an eminently bankable private investment. However, as a practical matter, it might be difficult to find a private banker willing to lend for such an investment with no collateral and a four-year grace period for repayment. We have reason to believe that markets for human capital investment are among the least efficient, but educational loan programs appear to have overcome some of these problems. The point is simple: A medical education is a very valuable private investment good, one that the physican should be willing to pay for, even though society wants more doctors and more medical care and is willing to use tax dollars to get them.

It does not necessarily follow that because medical schools are producing private goods in the form of physician education these goods might best be auctioned through the price mechanism. Public policy has increasingly been concerned with characteristics of those admitted to medical school: sex, race, the type and location of practice they expect to enter, and less tangible characteristics such as diligence. Our analysis of admissions decisions indicates that medical schools have been quite responsive to many of these social concerns. Equality of access to medical education is often discussed, but rarely, if ever, in

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[1] Cf. Frank A. Sloan, "Lifetime Earnings and Physicians' Choice of Specialty," Industrial and Labor Relations Review, Vol. 24, No. 1, October 1970, pp. 47-56; Rashi Fein and Gerald I. Weber, Financing Medical Education, McGraw-Hill Book Co., New York, 1971, pp. 245-253.

terms of the usual market meaning of willingness to pay. Public policy objectives related to medical school admission have been less well-articulated than one might wish. However, what we know and can infer about these objectives suggest that they require some interference in the market system. Economic theory suggests that the more interference required, the more the financing burden will rest on public shoulders.

Any discounted present value calculation has to make assumptions about the cost or price of the investment goods. In the case of medical education, these include such direct costs as tuition and books and the indirect opportunity costs of earnings forgone. In most calculations, the latter swamp the former, and this has historically been true for medical education. With rising tuition and higher stipends for interns and residents, tuition, particularly at levels sometimes suggested, has become more important in the calculation. If tuition were to be increased to levels approaching even some of the lower estimates of the "cost" of medical education, it would become an even greater consideration.

At this point we are less concerned with the implications of different medical school tuition levels than with the implications of how tuition levels--the prices of the private investment good--are set. The medical school market is, broadly speaking, a two-price system with relatively high tuitions ($2808 mean) for private schools and lower tuitions ($949 mean) for public schools.[1] Rationing in this system discriminates heavily in favor of residents. Public (state) medical school tuition levels are set through a political process in which the financial aspects of medical school management play a seemingly small role. By contrast, private school tuition levels appear to be governed much more by the financial exigencies of the school and by the price setting behavior of the rest of the public and private schools.

Other things equal, the two-price system will strengthen the public schools, where entry is largely restricted to residents, and weaken the private schools, which try to draw the most qualified applicants

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[1] JAMA, November 19, 1973, Vol. 226, No. 8, pp. 900-902.

from a broader pool. In an ordinary market, a two-price system will operate inefficiently. Access to medical education is not determined by purely market considerations, but we are inclined to put forth an analogous argument. From the point of view of the state, the tuition subsidy to prospective physicians is hard to justify. From the point of view of national welfare, differential tuition rates seem likely to result in an inferior match between student attributes and school attributes. However, more consideration should be given to the practical--as opposed to the purely theoretical--effects of the present two-price system.

Besides the cost of the investment, the other important element of discounted present value calculations is, of course, the price the product will bring. Physicians have recently been able to command high prices for their services, and the return to their education investment has been correspondingly high. There is substantial disagreement about the reasons for high cost medical care, but few would assert that the market for it has had characteristics conducive to an efficiently functioning market. Moreover, market imperfections, some of which (like imperfect information) seem inherent, most surely served to increase earnings of at least some categories of physicians.

The implications of these market imperfections for financing medical education lie not in their past or present effects but rather in the policy remedies that may be sought in the future. Since 1971, the federal government has administered price controls for medical care as a part of an overall anti-inflation policy. There is considerable debate among policymakers and policy observers regarding the merits of continued controls. Whatever the outcome of the debate, it will surely have implications for physicians' earnings and hence for burden-sharing of medical education costs.

Some form of national health insurance appears a strong prospect. Although the effects of physicians' earnings will depend on the kind of plan chosen, it is hard to imagine a national health insurance system that would have neutral price effects. Similarly, evolving changes in health care delivery systems, such as prepaid plans, will almost surely affect physician earnings. Our reason for raising these

questions regarding possible future changes in physicians' earnings is not to advocate a particular policy but to emphasize that policy with respect to human capital investment should concentrate on expected future, not experienced past, earnings.

NEW POLICY PROBLEMS

There is a considerable body of recent literature identifying a number of problems that can be traced backed to the medical education community. The AMA is often identified as the policy force behind medical education, and some trace an implicit (or explicit) conspiracy back to Abraham Flexner.[1] The problems identified include a restricted number of places in medical schools, discrimination against women and minorities, and a medical education system that is generally unresponsive to social needs.

We have not addressed ourselves to questions regarding the economic history of medical education, much less matters of conspiracy. The hypotheses presented in that literature cannot be rejected out of hand or with casual empiricism. Our data support the existence of some problems of restricted access to medical education in the recent past.

We are, however, impressed by what the data suggest about the changing nature of the medical education system and its responsiveness to federal program incentives. Capacity is expanding rapidly, discrimination against women has apparently disappeared, medical schools are seeking out and admitting qualified individuals from minority groups, and financial barriers to medical education have been lowered. Some long-standing problems are being resolved. However, as solutions to these problems appear within reach, the fundamental problems are revealed more clearly: What mix of health professionals will be needed to meet the changing demands society places on the health care delivery system? How do we provide the signals and incentives to direct the activities and outputs of the academic health centers to meet these needs?

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[1] See Reuben A. Kessel, "The AMA and the Supply of Physicians," Law and Contemporary Problems, Vol. XXXV, No. 2, Spring 1970, pp. 267-283; and Reuben A. Kessel, "Higher Education and The Nation's Health: A Review of the Carnegie Commission Report on Higher Education," Journal of Law and Economics, April 1972, pp. 115-127.